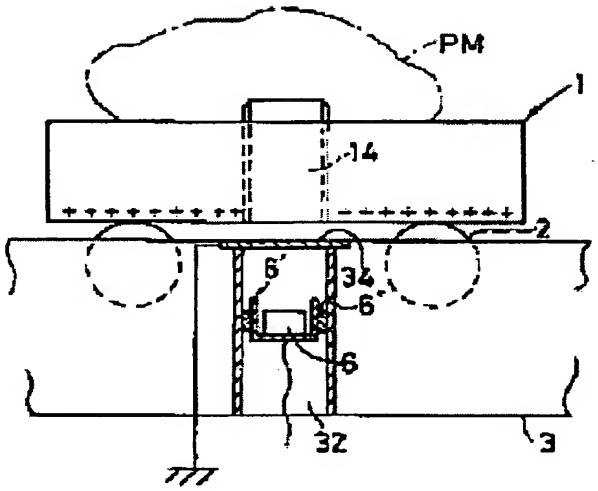
OPTICAL CHARACTERISTIC MEASURING DEVICE

Patent number: JP10062337
Publication date: 1998-03-06
Inventor: ITO MASAHIRO; MAEDA KAZUO; IIDA JUNJI; TERAJIMA AKIRA; SUZUKI SHUJI
Applicant: SUMITOMO METAL MINING CO
Classification:
- international: ***G01N21/27;*** **G01N21/25;** (IPC1-7): G01N21/27
- european:
Application number: JP19960241311 19960823
Priority number(s): JP19960241311 19960823

Abstract of **JP10062337**

PROBLEM TO BE SOLVED: To provide an optical characteristic measuring device in which the reduction in measuring precision resulted from the charging of a receiving member for placing a matter to be measured is dissolved. SOLUTION: This optical characteristic measuring device for measuring the optical characteristic of a matter to be measured from the reflected light from a light detector or the transmitted light thereby has a light source for irradiating a light to a pork PM (a matter to be measured) placed on an electric insulating tray (receiving member) 1 and a photovolatic light detector 6 on which the reflected light from the matter to be measured or the transmitted light thereby is incident. A protecting cover 34 formed of a light permeable conductive material such as Alx Zn1-x O is provided on the incident side of the light detector 6, and the protecting cover 34 is grounded. According to this device, the protecting cover 34 is never charged even when the receiving member is electrostatic. Thus, since a trace current (false current) resulted from the charging of the receiving member is never output from the light detector, the optical characteristic of the matter to be measured can be measured with high precision.



DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical property measuring device which measures optical properties, such as food, from Mitsuteru putting, its reflected light, or the transmitted light to garden stuff, such as food, such as meat, and a melon, and relates the freshness of food, the sugar content of garden stuff, etc. to amelioration of a measurable optical property measuring device in a high precision from this optical property especially.
[0002]
[Description of the Prior Art] The equipment which measures the sugar content of garden stuff in un-destroying by light absorption measurement in the sugar of the light by which irradiated light to garden stuff, such as a peach, citruses, grapes, a melon, and a tomato, as this kind of an optical property measuring device, and outgoing radiation was carried out from garden stuff is known (refer to JP,1-301147,A).
[0003] A melon, a watermelon, etc. are compared with the above-mentioned grapes, citruses, etc. when it is going to measure the sugar content of garden stuff, such as a melon and a watermelon, in un-destroying using this equipment. By the way, since that exocarp is thick and size's is large, it was difficult to obtain the detection light (namely, light by which outgoing radiation is carried out from garden stuff, such as a melon and a watermelon) of reinforcement sufficient in a melon, a watermelon, etc. being deep and carrying out until osmosis of this exposure light, even if it applies laser etc. as an exposure light. and unless garden stuff is deep and exposure light carries out until osmosis of a melon, the watermelon, etc., the average sugar content of the garden stuff of a piece is not obtained proper, and if detection light is weak, the accuracy of measurement will fall. In addition, although how to increase the power of exposure light, such as laser to garden stuff, such as a melon and a watermelon, and raise the accuracy of measurement is also considered, it originates in a rise on the strength, a garden stuff front face, such as a melon and a watermelon, is burned, and nondestructive inspection becomes difficult.
[0004] this invention person etc. has already proposed the non-destroying sugar content measuring device which can measure the sugar content of garden stuff etc. in a high precision under such a technological background, without increasing the power of exposure light, such as laser. Namely, the principal part of a conveyance system consists of roller conveyors f as a driving means to which the guide e to which it shows the tray d which garden stuff, such as a melon, is laid and moves a conveyance on the street as this equipment is shown in drawing 10 , and this tray d along a conveyance way, and the above-mentioned tray d are moved. As shown in the above-mentioned tray d at drawing 11 , while forming the tray side [at least two] optical-channel sections g and h which one open end contacts the peripheral face of garden stuff M along the thickness direction, and another side exposes from the base side of Tray d The test section k which one open end equips with the

measurement side [at least two] optical-channel sections i and j by which location adjustment was carried out with the open end of the tray side optical-channel sections g and h is arranged in the part which counters the base side of the tray d in a conveyance way. While irradiating the light from the light source (not shown) to garden stuff M by optical fiber a at one measurement side optical-channel section i and this through the tray side optical-channel section g by which location adjustment was carried out in this test section k It is made to carry out incidence of the light by which outgoing radiation was carried out to the tray side optical-channel section h of another side, and this from garden stuff M to Photodetector b through the measurement side optical-channel section j by which location adjustment was carried out.

[0005] And according to this non-destroying sugar content measuring device, since the leakage light at the time of photodetection is prevented by the list at the time of an optical exposure according to an operation of the above-mentioned tray side optical-channel sections g and h or the measurement side optical-channel sections i and j, while being able to carry out incidence of the light efficiently inside garden stuff M, the outgoing radiation light from garden stuff M also becomes possible [carrying out incidence into Photodetector b efficiently].

[0006] Therefore, it was that by which the sugar content etc. is measured in a high precision, without increasing the power of the exposure light to garden stuff, such as a melon.

[0007]

[Problem(s) to be Solved by the Invention] By the way, what consists of insulating ingredients, such as black ABS (acrylonitrile styrene butadiene rubber) resin as receiving part material in which device under tests, such as Tray d, are laid in this kind of optical property measuring device, is usually used.

[0008] Moreover, in order to prevent dirt, mechanical destruction, etc. by the foreign matter which photoelectromotive-force mold detectors, such as a photodiode, are generally adopted, and adhered to the device under test as a photodetector b with which incidence of the reflected light or the transmitted light from device under tests, such as garden stuff, is carried out, protective cover c which consisted of transparent materials, such as glass, is usually prepared in the optical incidence side (refer to drawing 11).

[0009] For this reason, when it is electrified by receiving part material, such as the above-mentioned tray d, by frictional electrification with a roller conveyor f etc. during conveyance (or when the device under test laid in the receiving part material which consisted of insulating ingredients is the insulating matter and it is electrified by this device under test according to a certain cause), The above-mentioned protective cover c may also be charged by electrostatic induction, static electricity occurred in Photodetector b by this electrification, and the minute amount current might be outputted from Photodetector b.

[0010] And since it could not set up greatly about the power of exposure light, such as laser, in consideration of [having mentioned above] damage, destruction, etc. of a device under test, when the minute amount current which considered static electricity as the cause was included in the output current value corresponding to the above-mentioned reflected light or the transmitted light and it had been outputted from Photodetector b, it had the part in which data unrelated to a device under test are contained, and the trouble that the accuracy of measurement of the called-for optical property fell greatly.

[0011] Moreover, when the optical path length of the light in which a device under test penetrates the interior, such as being greatly thick, becomes long also with the equipment with which a device under test possesses thermal resistance, and can set up the power of exposure light, such as laser, strongly, since the signal from a photodetector becomes a minute amount, it has the same trouble.

[0012] And since the relative position of the receiving part material and the above-mentioned protective cover with which it was electrified in the equipment conveyed by the conveyance means by the above-mentioned receiving part material which lays a device under test was changed with time [the amount of static electricity which changes with time and is generated in a photodetector in

connection with this], the above-mentioned trouble was remarkable.
[0013] Moreover, since the charge distribution may have changed and a fake current may have flowed to an optical detector by this when the device under test (or receiving part material) wears static electricity also in the equipment with which the above-mentioned receiving part material is not conveyed, a wind hits a device under test etc. or people approach, it had the trouble that the accuracy of measurement of the called-for optical property fell greatly.
[0014] This invention was made paying attention to such a trouble, and the place made into the technical problem is to offer the optical property measuring device with which the fall of the accuracy of measurement resulting from static electricity, such as the above-mentioned receiving part material, is canceled.
[0015]
[Means for Solving the Problem] Namely, the light source which irradiates light to the device under test laid in the receiving part material by which invention concerning claim 1 was constituted from an insulating ingredient, It has the photodetector of the photoelectromotive-force mold with which incidence of the reflected light or the transmitted light from the above-mentioned device under test is carried out. It is characterized by preparing the protective cover which consisted of the reflected light by which incidence was carried out to this photodetector, or the transmitted light with the conductive ingredient of light transmission nature at the optical incidence side of the above-mentioned photodetector on the assumption that the optical property measuring device which measures the optical property of a device under test, and grounding this protective cover.
[0016] And since according to the optical property measuring device concerning invention according to claim 1 the protective cover prepared in the optical incidence side of a photodetector consists of conductive ingredients of light transmission nature and this protective cover is grounded, even when it is electrified by the receiving part material which lays a device under test, the above-mentioned protective cover is not charged by electrostatic induction.
[0017] Therefore, the minute amount current which considered static electricity of the above-mentioned receiving part material as the cause is included in the output current value corresponding to the reflected light or the transmitted light from a device under test, and since it becomes that it is hard to be outputted from a photodetector, it becomes possible to measure this in a high precision about the optical property of a device under test irrespective of the existence of electrification of receiving part material.
[0018] The sintered compact which carried out minute amount (0.5 - 4at%) mixing of the element of an III group or IV group, for example, AlxZn1-xO, SixZn1-xO (x=0.005-0.04), etc. are mentioned to the ZnO sintered compact which has permeability from a visible region to a near-infrared (2 micrometers or less) light as a conductive ingredient of the light transmission nature which constitutes the above-mentioned protective cover in this invention, or this.
[0019] In addition, the same effectiveness is acquired even if it changes into the structure of replacing the whole protective cover with the approach of constituting from a conductive ingredient of light transmission nature, constituting from an insulating ingredient of light transmission nature, such as glass and a transparent plastic, and preparing the conductive light transmission film in one side or both sides of this protective cover. Invention concerning claim 2 is made from such a reason.
[0020] Namely, the light source which irradiates light to the device under test laid in the receiving part material by which invention concerning claim 2 was constituted from an insulating ingredient, It has the photodetector of the photoelectromotive-force mold with which incidence of the reflected light or the transmitted light from the above-mentioned device under test is carried out. It is premised on the optical property measuring device which measures the optical property of a device under test from the reflected light by which incidence was carried out to this photodetector, or the transmitted light. While the protective cover which consisted of insulating ingredients of light transmission nature is prepared in the optical incidence side of the above-mentioned photodetector and the conductive light

transmission film is produced by one side or both sides of this protective cover, it is characterized by grounding this conductive light transmission film.
[0021] In addition, this receiving part material of the problem accompanying electrification of the above-mentioned receiving part material mentioned above is remarkable in the equipment suitably conveyed by the conveyance means. Invention concerning claim 3 is made from such a reason.
[0022] That is, invention concerning claim 3 is characterized by measuring the optical property of the device under test laid while making the above-mentioned tray convey in the test section which the above-mentioned receiving part material is the tray conveyed by the conveyance means, and was prepared all over the conveyance way on the assumption that the optical property measuring device concerning invention according to claim 1 or 2.
[0023] Moreover, it is ITO (indium oxide by which tin oxide was added) which has permeability from a visible region to a near-infrared (2 micrometers or less) light especially although the ingredient of arbitration is applicable as the above-mentioned conductive light transmission film in invention according to claim 2 or 3, and SnO2, ZnO and InO2. Or application of mixed oxides, such as this, etc. is desirable (claim 4).
[0024] Moreover, when the protective cover which has the same function as the above-mentioned protective cover is already built into the photodetector to apply, the approach of making the configuration of claim 1 or claim 2 providing about the protective cover incorporated may be taken. However, even when the protective cover is built into the photodetector, even if it arranges a protective cover different from this, it is good with a natural thing. In this case, what is necessary is just to make the configuration of claim 1 or claim 2 provide about one [at least] protective cover.
[0025] Moreover, the optical property measuring device by non-contact [concerning this invention / which made the light or near-infrared light the light source as a candidate for application of an optical property measuring device / un-destroying or non-contact] etc. is various. Moreover, it is applicable not only to the equipment which cannot but set up the power of exposure light weakly but the equipment which can set up the above-mentioned power strongly. It is because the signal from a photodetector becomes a minute amount, so it has the same trouble when the optical path length of the light in which a device under test penetrates the interior, such as being greatly thick, becomes long, as mentioned above also with such equipment.
[0026] Moreover, as the above-mentioned device under test, not only garden stuff, such as food, such as meat illustrated with the conventional technique, and a peach, citruses, grapes, a melon, a tomato, a watermelon, a Japanese pumpkin, but rice, a powder ingredient, etc. are arbitration.
[0027]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
[0028] [the gestalt of the first operation] -- the optical property measuring device concerning the gestalt of this operation -- the optical property (the freshness of meat is detected by whether the weak absorption band of the metmyoglobin by oxidization is detected in near 650nm.) of meat That is, it is related with the food evaluation equipment which can measure that freshness from this absorption band not being detected to fresh meat.
[0029] Namely, the tray 1 on which it consists of black ABS plastics, and the pork PM for [measured] is laid as this optical property measuring device is shown in drawing 1 - drawing 3 , The conveyance means 2 which consists of the roller conveyor which conveys this tray 1 in the direction of an arrow head, One box-like test section 3 prepared all over the conveyance way of a tray, and the semiconductor laser 4 which outputs the laser beam near 650nm, The optical fiber 5 which lead the laser beam from the semiconductor laser 4 which is the light source to the above-mentioned test section 3, and a laser beam is made to irradiate to the pork PM for [measured], The photodetector 6 with which the laser beam by which is prepared in the above-mentioned test section 3, and outgoing radiation is carried out from the pork PM for [measured] consists of the photodiode by which

incidence is carried out, The tray sensor 8 which detects the detected member 7 of the patagium which has been arranged near the above-mentioned test section 3, and was prepared in the tray 1, and detects the arrival timing of a tray 1, The principal part consists of a device-under-test detector 9 which is similarly arranged near the test section 3 and judges the existence of the pork PM on a tray 1, and a guide 11 which the engagement roller 10 attached to the side face of the above-mentioned tray 1 is engaged, and it shows to the conveyance direction of a tray 1.

[0030] First, while the above-mentioned tray 1 is constituted from the shape of a rectangle by the plate made of ABS plastics as shown in drawing 1 and drawing 3 , and the receiving part 12 of a circle configuration in which the pork PM for [measured] is laid is formed in the center of abbreviation The tray side [two] optical-channel sections 13 and 14 which the open end of projection another side exposes [one open end] to the method of outside from the base side of a tray 1 from receiving part 12 top face at an upper part side are established by this receiving part 12 along that thickness direction. In addition, it is sharp and this tip side is pierced in the pork PM for [measured] by the tip side of an open end where each tray side optical-channel sections 13 and 14 project.

[0031] The measurement side optical-channel sections 31 and 32 which change from two barrels by which location adjustment was carried out with the test-section side open end of the tray side optical-channel sections 13 and 14 to the above-mentioned test section 3 on the other hand are formed. And while the optical fiber 5 which transmits the laser beam from semiconductor laser 4 in the measurement side optical-channel section 31 of one of these is arranged, in the measurement side optical-channel section 32 of another side, the photodetector 6 with which incidence of the laser beam by which outgoing radiation is carried out from Pork PM is carried out is arranged.

[0032] Moreover, while the glass protective cover 33 is inserted in the tray side open end of the measurement side optical-channel section 31 and the protective cover 34 which consists of the sintering plate of AlxZn1-xO (x= 0.01) is inserted also in the tray side open end of the measurement side optical-channel section 32, this protective cover 34 is grounded as shown in drawing 3 R> 3 and drawing 4 (touch-down).

[0033] Moreover, when the detecting signal from the above-mentioned tray sensor 8 and the device-under-test detector 9 is inputted into the power source 100 of the above-mentioned semiconductor laser 4, and the detecting signal from the device-under-test detector 9 is inputted and the detecting signal from the tray sensor 8 is inputted, a power source 100 operates and a laser beam is irradiated from semiconductor laser 4. Moreover, when the detecting signal from the device-under-test detector 9 is not inputted (namely, when Pork PM does not exist in a tray 1) or the detecting signal from the tray sensor 8 is not inputted, it is set up so that the above-mentioned power source 100 may serve as OFF.

[0034] And if the tray 1 which laid Pork PM passes a test section 3 in this optical property measuring device, the above-mentioned power source 100 will carry out ON actuation, and the laser beam near 650nm will irradiate in a test section 3. While this laser beam is irradiated in Pork PM through the measurement side optical-channel section 31 and the tray side optical-channel section 13 Incidence of the outgoing radiation light from Pork PM is carried out to a photodetector 6 through the tray side optical-channel section 14 and the measurement side optical-channel section 32, a 650nm absorption spectrum is measured, and the freshness of Pork PM is measured.

[0035] As shown in drawing 4 , even when the tray 1 which laid Pork PM is electrified by frictional electrification with the conveyance means 2 etc. at this time, the protective cover 34 prepared in the optical incidence side of a photodetector 6 is not charged by electrostatic induction.

[0036] Therefore, since the minute amount current (fake current) which considered electrification of the above-mentioned tray 1 as the cause is not included in the output current value outputted from a photodetector 6, it has the advantage which can measure this in a high precision about the optical property of the pork PM for [measured].

[0037] In addition, in the gestalt of this operation, the above-mentioned photodetector 6 is held in

cross-section abbreviation KO character-like case 6', and case 6' of a parenthesis is fixed by the internal surface of the measurement side optical-channel section 32 through adhesives 6", and it is arranged. In this case, it is desirable, especially when the internal surface of above-mentioned case 6', and the adhesives 6" and the measurement side optical-channel section 32 etc. is constituted from a conductive ingredient and the whole is grounded through the protective cover 34 (touch-down). When it is made such a configuration, it is because the photodetector 6 whole can be shielded by conductivity.

[0038] Moreover, although constituted from the baking plate of AlxZn1-xO by the above-mentioned protective cover 34 in the gestalt of this operation, while this protective cover 34 is constituted from a glass plate 36 as shown in drawing 5 , and making the tray side front face of this glass plate 36 produce the conductive light transmission film 37 which consists of an ITO thin film, the same effectiveness is acquired even if it changes into the structure where this conductive light transmission film 37 was grounded. Moreover, as shown in drawing 6 , when the glass protective cover 38 is already built into the above-mentioned photodetector 6, while making the conductive light transmission film 39 which changes from an ITO thin film to the tray side front face of this protective cover 38 produce, you may change into the structure where this conductive light transmission film 39 was grounded.

[0039] Moreover, although it has the structure which measures the laser beam by which irradiates a laser beam from the bottom to the pork PM for [measured] in the gestalt of this operation, and outgoing radiation is carried out from Pork PM with the photodetector 6 arranged to the down side, it may make the structure which measures the laser beam by which replaces with this structure, and irradiates a laser beam from a side-face side to Pork PM, and outgoing radiation is carried out from Pork PM with the photodetector which has arranged to the side-face side.

[0040] [the gestalt of the second operation] -- the optical property measuring device concerning the gestalt of this operation irradiates a laser beam to garden stuff, such as a melon and a watermelon, and is related with the non-destroying sugar content measuring device which measures the sugar content of garden stuff in un-destroying by light absorption measurement in the sugar of the laser beam by which outgoing radiation was carried out from garden stuff.

[0041] Namely, the tray 201 on which this optical property measuring device lays garden stuff M, such as a melon for [measured], as shown in drawing 7 - drawing 8 , The conveyance means 202 which consists of the roller conveyor which conveys this tray 201 in the direction of an arrow head, Three box-like test sections 203, 204, and 205 suitably arranged through spacing in this conveyance way, The optical fibers 271, 272, and 273 which lead the laser beam from three semiconductor laser 261, 262, and 263 which is the light source to the above-mentioned test sections 203, 204, and 205, and a laser beam is made to irradiate to the above-mentioned garden stuff M, Each test sections 203 and 204 and the photodetector 206 with which incidence of the laser beam by which is prepared in 205, respectively and outgoing radiation is carried out from garden stuff M is carried out, The tray sensor which detects detected members (not shown), such as a light reflex tape which has been arranged near each test sections 203, 204, and 205, and was prepared in the above-mentioned tray 201, and detects the arrival timing of the tray 201 in each test sections 203, 204, and 205 (not shown), The analog-to-digital converter 281 which changes the analog data from the above-mentioned photodetector 206 into digital data, The computer 282 with a display into which the arrival signal from data and the tray sensor from the above-mentioned photodetector 206 etc. is inputted through this analog-to-digital converter 281 (CPU), That principal part consists of an analog-to-digital converter 283 connected to this computer (CPU) 282, and power sources 291, 292, and 293 for exciting respectively the above-mentioned semiconductor laser 261, 262, and 263.

[0042] Moreover, the above-mentioned tray 201 consists of black ABS (acrylonitrile styrene butadiene rubber) resin, as shown in drawing 8 . Project to an upper part side from cylinder-like the tray bottom section 211 and this tray bottom section 211, and that principal part consists of the

approximate circle column-like tray top sections 212 which have the datum level 200 of the pair which cut that part and was formed by lacking. And while the earthenware mortar-like receiving part 213 is formed in the top face of the above-mentioned tray top section 212 and the tray side [two] optical-channel sections 214 and 215 are formed in this receiving part 213 The detected member which consists of a light reflex tape etc. is prepared in each upper part section of the datum level 200 of the pair, and **** 216 into which **** 290 prepared in the top face of the above-mentioned test sections 203, 204, and 205 is made to fit loosely possible [sliding] is formed in the base side abbreviation center section of the tray bottom section 211. In addition, the color of the tray 201 whole is black, and opaque.

[0043] On the other hand, above-mentioned **** 290 is formed in the top-face side central part at each test sections 203, 204, and 205. And while the measurement side optical-channel sections 231 and 232 which consist of two barrels by which location adjustment was carried out with the test-section side open end of the above-mentioned tray side optical-channel sections 214 and 215 are formed The optical fiber 271 which transmits the laser beam from the above-mentioned semiconductor laser 261 to the open end of the measurement side optical-channel section 231 of one of these is arranged. The photodetector 206 is arranged in the measurement side optical-channel section 232 of another side (although it is explanation about a test section 203, also in other test sections 204 and 205, it has same structure). In addition, the operation of **** 290 prepared in the top-face side of the above-mentioned test section 203 prevents the enter lump into the measurement side optical-channel section 232 of the laser beam from an optical fiber 271 which passes the measurement side optical-channel section 231, in order that this **** 290 may intercept the clearance between a tray 201 and a test section 203, as shown in drawing 8 . For this reason, incidence only of the outgoing radiation light from garden stuff M will be carried out to the photodetector 206 arranged in the measurement side optical-channel section 232, and the measurement error of the sugar content resulting from the leakage light of the above-mentioned laser beam can be avoided.

[0044] Moreover, while the glass protective cover 233 is inserted in the tray side open end of the above-mentioned measurement side optical-channel section 231 While the conductive light transmission film 235 which the glass protective cover 234 is inserted also in the tray side open end of the measurement side optical-channel section 232, and changes from an ITO thin film to the tray side front face of this protective cover 234 is produced This conductive light transmission film 235 is grounded as shown in drawing 8 (although it is explanation about a test section 203, also in other test sections 204 and 205, it has same structure). (touch-down)

[0045] Whenever the tray 201 which laid garden stuff M in this optical property measuring device passes each test sections 203, 204, and 205, each power sources 291, 292, and 293 carry out ON actuation. While a 930nm laser beam irradiates between 20 mses in a test section 203 and this laser beam is irradiated from an optical fiber 271 to garden stuff M through the measurement side optical-channel section 231 and the tray side optical-channel section 214 Incidence of the outgoing radiation light from garden stuff M is carried out to a photodetector 206 through the tray side optical-channel section 215 and the measurement side optical-channel section 232. Hereafter, in a test section 204, a 880nm laser beam is similarly irradiated to a 910nm laser beam between 20 mses in a test section 205 between 20 mses, and incidence of the outgoing radiation light from garden stuff M is carried out to each photodetector (not shown), and the sugar content of garden stuff M is measured. In addition, as shown in drawing 7 , measurement of this etc. is performed in a dark room.

[0046] And as this optical property measuring device is shown in drawing 8 R> 8, even when the tray 201 which laid garden stuff M is electrified by frictional electrification with the conveyance means 202 etc., each protective cover (the protective cover 234 of a test section 203 is shown in drawing 8) prepared in the optical incidence side of each photodetector (the photodetector 206 of a test section 203 is shown in drawing 8) is not charged by electrostatic induction.

[0047] Therefore, since the minute amount current (fake current) which considered electrification of a

tray 201 as the cause is not included in the output current value outputted from each photodetector, it has the advantage which can measure this in a high precision about the optical property of the garden stuff M for [measured] like the optical property measuring device concerning the gestalt of the first operation.

[0048] [the gestalt of the third operation] -- the optical property measuring device concerning the gestalt of this operation is related with a non-destroying sugar content measuring device as well as the equipment concerning the gestalt of the second operation.

[0049] Namely, the box 302 which has the installation base 301 made of ABS plastics in which a whole surface side can open and close by the door 300, and garden stuff M is laid as this optical property measuring device is shown in drawing 9 , It is each laser beam (930nm) to the garden stuff M which led to the test section (not shown) in which each laser beam from three semiconductor laser 361, 362, and 363 was prepared at the lower part side of the above-mentioned installation base 301, and was laid in the installation base 301. The optical fibers 371, 372, and 373 which carry out the sequential exposure of 910nm and the 880nm, The single photodetector with which incidence of the laser beam (930nm, 910nm, and 880nm) by which is arranged at the above-mentioned test section and outgoing radiation is carried out from garden stuff M is carried out (not shown), The analog-to-digital converter which changes the analog data from this photodetector into digital data, The computer 382 into which the data from the above-mentioned photodetector etc. are inputted (CPU), The analog-to-digital converter connected to this computer (CPU) 382, The principal part consists of power sources 391, 392, and 393 for exciting respectively the above-mentioned semiconductor laser 361, 362, and 363. And if it changes from the sintering plate of AlxZn1-xO (x= 0.01) to the optical incidence side of the above-mentioned photodetector, the protective cover (not shown) by which the ** ground (touch-down) was carried out is arranged.

[0050] In addition, in this optical property measuring device, the sugar content of garden stuff M, such as a melon, is measured by the same principle as the equipment concerning the gestalt of the second operation.

[0051] And even when the installation base 301 in which the above-mentioned garden stuff M is laid in this optical property measuring device is charged by a certain cause, the protective cover prepared in the optical incidence side of a photodetector is not charged by electrostatic induction.

[0052] Therefore, it has the advantage which can measure this in a high precision about the optical property of the garden stuff M for [measured] like the optical property measuring device concerning the gestalt of the second operation.

[0053]

[Effect of the Invention] Since according to the optical property measuring device concerning invention according to claim 1 or 3 the protective cover prepared in the optical incidence side of a photodetector consists of conductive ingredients of light transmission nature and this protective cover is grounded, even when electrified by the receiving part material which lays a device under test, the above-mentioned protective cover is not charged by electrostatic induction.

[0054] Therefore, since the minute amount current (fake current) which considered static electricity of the above-mentioned receiving part material as the cause is included in the output current value corresponding to the reflected light or the transmitted light from a device under test and it is not outputted from a photodetector, it has the effectiveness which can measure this in a high precision about the optical property of a device under test irrespective of the existence of electrification of receiving part material.

[0055] On the other hand, since according to the optical property measuring device concerning invention according to claim 2 to 4 the conductive light transmission film is produced by one side or both sides of a protective cover which consist of the insulating ingredient of the light transmission nature prepared in the optical incidence side of a photodetector and this conductive light transmission film is grounded, even when electrified by the receiving part material which lays a device under test,

the above-mentioned protective cover is not charged by electrostatic induction.
[0056] Therefore, since the minute amount current (fake current) which considered static electricity of the above-mentioned receiving part material as the cause is included in the output current value corresponding to the reflected light or the transmitted light from a device under test like invention concerning claim 1 or 3 and it is not outputted from a photodetector, it has the effectiveness which can measure this in a high precision about the optical property of a device under test irrespective of the existence of electrification of receiving part material.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] The equipment which measures the sugar content of garden stuff in un-destroying by light absorption measurement in the sugar of the light by which irradiated light to garden stuff, such as a peach, citruses, grapes, a melon, and a tomato, as this kind of an optical property measuring device, and outgoing radiation was carried out from garden stuff is known (refer to JP,1-301147,A).
[0003] A melon, a watermelon, etc. are compared with the above-mentioned grapes, citruses, etc. when it is going to measure the sugar content of garden stuff, such as a melon and a watermelon, in un-destroying using this equipment. By the way, since that exocarp is thick and size's is large, it was difficult to obtain the detection light (namely, light by which outgoing radiation is carried out from garden stuff, such as a melon and a watermelon) of reinforcement sufficient in a melon, a watermelon, etc. being deep and carrying out until osmosis of this exposure light, even if it applies laser etc. as an exposure light. and unless garden stuff is deep and exposure light carries out until osmosis of a melon, the watermelon, etc., the average sugar content of the garden stuff of a piece is not obtained proper, and if detection light is weak, the accuracy of measurement will fall. In addition, although how to increase the power of exposure light, such as laser to garden stuff, such as a melon and a watermelon, and raise the accuracy of measurement is also considered, it originates in a rise on the strength, a garden stuff front face, such as a melon and a watermelon, is burned, and nondestructive inspection becomes difficult.
[0004] this invention person etc. has already proposed the non-destroying sugar content measuring device which can measure the sugar content of garden stuff etc. in a high precision under such a technological background, without increasing the power of exposure light, such as laser. Namely, the principal part of a conveyance system consists of roller conveyors f as a driving means to which the guide e to which it shows the tray d which garden stuff, such as a melon, is laid and moves a conveyance on the street as this equipment is shown in drawing 10 , and this tray d along a conveyance way, and the above-mentioned tray d are moved. As shown in the above-mentioned tray d at drawing 11 , while forming the tray side [at least two] optical-channel sections g and h which one open end contacts the peripheral face of garden stuff M along the thickness direction, and another side exposes from the base side of Tray d The test section k which one open end equips with the measurement side [at least two] optical-channel sections i and j by which location adjustment was carried out with the open end of the tray side optical-channel sections g and h is arranged in the part which counters the base side of the tray d in a conveyance way. While irradiating the light from the light source (not shown) to garden stuff M by optical fiber a at one measurement side optical-channel section i and this through the tray side optical-channel section g by which location adjustment was carried out in this test section k It is made to carry out incidence of the light by which outgoing radiation was carried out to the tray side optical-channel section h of another side, and this from garden stuff M to Photodetector b through the measurement side optical-channel section j by which

location adjustment was carried out.
[0005] And according to this non-destroying sugar content measuring device, since the leakage light at the time of photodetection is prevented by the list at the time of an optical exposure according to an operation of the above-mentioned tray side optical-channel sections g and h or the measurement side optical-channel sections i and j, while being able to carry out incidence of the light efficiently inside garden stuff M, the outgoing radiation light from garden stuff M also becomes possible [carrying out incidence into Photodetector b efficiently].
[0006] Therefore, it was that by which the sugar content etc. is measured in a high precision, without increasing the power of the exposure light to garden stuff, such as a melon.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the optical property measuring device which measures optical properties, such as food, from Mitsuteru putting, its reflected light, or the transmitted light to garden stuff, such as food, such as meat, and a melon, and relates the freshness of food, the sugar content of garden stuff, etc. to amelioration of a measurable optical property measuring device in a high precision from this optical property especially.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since according to the optical property measuring device concerning invention according to claim 1 or 3 the protective cover prepared in the optical incidence side of a photodetector consists of conductive ingredients of light transmission nature and this protective cover is grounded, even when electrified by the receiving part material which lays a device under test, the above-mentioned protective cover is not charged by electrostatic induction.
[0054] Therefore, since the minute amount current (fake current) which considered static electricity of the above-mentioned receiving part material as the cause is included in the output current value corresponding to the reflected light or the transmitted light from a device under test and it is not outputted from a photodetector, it has the effectiveness which can measure this in a high precision about the optical property of a device under test irrespective of the existence of electrification of receiving part material.
[0055] On the other hand, since according to the optical property measuring device concerning invention according to claim 2 to 4 the conductive light transmission film is produced by one side or both sides of a protective cover which consist of the insulating ingredient of the light transmission nature prepared in the optical incidence side of a photodetector and this conductive light transmission film is grounded, even when electrified by the receiving part material which lays a device under test, the above-mentioned protective cover is not charged by electrostatic induction.
[0056] Therefore, since the minute amount current (fake current) which considered static electricity of the above-mentioned receiving part material as the cause is included in the output current value corresponding to the reflected light or the transmitted light from a device under test like invention concerning claim 1 or 3 and it is not outputted from a photodetector, it has the effectiveness which can measure this in a high precision about the optical property of a device under test irrespective of the existence of electrification of receiving part material.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, what consists of insulating ingredients, such as black ABS (acrylonitrile styrene butadiene rubber) resin as receiving part material in which device under tests, such as Tray d, are laid in this kind of optical property measuring device, is usually used.
[0008] Moreover, in order to prevent dirt, mechanical destruction, etc. by the foreign matter which photoelectromotive-force mold detectors, such as a photodiode, are generally adopted, and adhered to the device under test as a photodetector b with which incidence of the reflected light or the transmitted light from device under tests, such as garden stuff, is carried out, protective cover c which consisted of transparent materials, such as glass, is usually prepared in the optical incidence side (refer to drawing 11).
[0009] For this reason, when it is electrified by receiving part material, such as the above-mentioned tray d, by frictional electrification with a roller conveyor f etc. during conveyance (or when the device under test laid in the receiving part material which consisted of insulating ingredients is the insulating matter and it is electrified by this device under test according to a certain cause), The above-mentioned protective cover c may also be charged by electrostatic induction, static electricity occurred in Photodetector b by this electrification, and the minute amount current might be outputted from Photodetector b.
[0010] And since it could not set up greatly about the power of exposure light, such as laser, in consideration of [having mentioned above] damage, destruction, etc. of a device under test, when the minute amount current which considered static electricity as the cause was included in the output current value corresponding to the above-mentioned reflected light or the transmitted light and it had been outputted from Photodetector b, it had the part in which data unrelated to a device under test are contained, and the trouble that the accuracy of measurement of the called-for optical property fell greatly.
[0011] Moreover, when the optical path length of the light in which a device under test penetrates the interior, such as being greatly thick, becomes long also with the equipment with which a device under test possesses thermal resistance, and can set up the power of exposure light, such as laser, strongly, since the signal from a photodetector becomes a minute amount, it has the same trouble.
[0012] And since the relative position of the receiving part material and the above-mentioned protective cover with which it was electrified in the equipment conveyed by the conveyance means by the above-mentioned receiving part material which lays a device under test was changed with time [the amount of static electricity which changes with time and is generated in a photodetector in connection with this], the above-mentioned trouble was remarkable.
[0013] Moreover, since the charge distribution may have changed and a fake current may have flowed to an optical detector by this when the device under test (or receiving part material) wears static electricity also in the equipment with which the above-mentioned receiving part material is not conveyed, a wind hits a device under test etc. or people approach, it had the trouble that the accuracy

of measurement of the called-for optical property fell greatly.
[0014] This invention was made paying attention to such a trouble, and the place made into the technical problem is to offer the optical property measuring device with which the fall of the accuracy of measurement resulting from static electricity, such as the above-mentioned receiving part material, is canceled.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] Namely, the light source which irradiates light to the device under test laid in the receiving part material by which invention concerning claim 1 was constituted from an insulating ingredient, It has the photodetector of the photoelectromotive-force mold with which incidence of the reflected light or the transmitted light from the above-mentioned device under test is carried out. It is characterized by preparing the protective cover which consisted of the reflected light by which incidence was carried out to this photodetector, or the transmitted light with the conductive ingredient of light transmission nature at the optical incidence side of the above-mentioned photodetector on the assumption that the optical property measuring device which measures the optical property of a device under test, and grounding this protective cover.
[0016] And since according to the optical property measuring device concerning invention according to claim 1 the protective cover prepared in the optical incidence side of a photodetector consists of conductive ingredients of light transmission nature and this protective cover is grounded, even when it is electrified by the receiving part material which lays a device under test, the above-mentioned protective cover is not charged by electrostatic induction.
[0017] Therefore, the minute amount current which considered static electricity of the above-mentioned receiving part material as the cause is included in the output current value corresponding to the reflected light or the transmitted light from a device under test, and since it becomes that it is hard to be outputted from a photodetector, it becomes possible to measure this in a high precision about the optical property of a device under test irrespective of the existence of electrification of receiving part material.
[0018] The sintered compact which carried out minute amount (0.5 - 4at%) mixing of the element of an III group or IV group, for example, AlxZn1-xO, SixZn1-xO (x=0.005-0.04), etc. are mentioned to the ZnO sintered compact which has permeability from a visible region to a near-infrared (2 micrometers or less) light as a conductive ingredient of the light transmission nature which constitutes the above-mentioned protective cover in this invention, or this.
[0019] In addition, the same effectiveness is acquired even if it changes into the structure of replacing the whole protective cover with the approach of constituting from a conductive ingredient of light transmission nature, constituting from an insulating ingredient of light transmission nature, such as glass and a transparent plastic, and preparing the conductive light transmission film in one side or both sides of this protective cover. Invention concerning claim 2 is made from such a reason.
[0020] Namely, the light source which irradiates light to the device under test laid in the receiving part material by which invention concerning claim 2 was constituted from an insulating ingredient, It has the photodetector of the photoelectromotive-force mold with which incidence of the reflected light or the transmitted light from the above-mentioned device under test is carried out. It is premised on the optical property measuring device which measures the optical property of a device under test from the reflected light by which incidence was carried out to this photodetector, or the transmitted light. While

the protective cover which consisted of insulating ingredients of light transmission nature is prepared in the optical incidence side of the above-mentioned photodetector and the conductive light transmission film is produced by one side or both sides of this protective cover, it is characterized by grounding this conductive light transmission film.

[0021] In addition, this receiving part material of the problem accompanying electrification of the above-mentioned receiving part material mentioned above is remarkable in the equipment suitably conveyed by the conveyance means. Invention concerning claim 3 is made from such a reason.

[0022] That is, invention concerning claim 3 is characterized by measuring the optical property of the device under test laid while making the above-mentioned tray convey in the test section which the above-mentioned receiving part material is the tray conveyed by the conveyance means, and was prepared all over the conveyance way on the assumption that the optical property measuring device concerning invention according to claim 1 or 2.

[0023] Moreover, it is ITO (indium oxide by which tin oxide was added) which has permeability from a visible region to a near-infrared (2 micrometers or less) light especially although the ingredient of arbitration is applicable as the above-mentioned conductive light transmission film in invention according to claim 2 or 3, and SnO2, ZnO and InO2. Or application of mixed oxides, such as this, etc. is desirable (claim 4).

[0024] Moreover, when the protective cover which has the same function as the above-mentioned protective cover is already built into the photodetector to apply, the approach of making the configuration of claim 1 or claim 2 providing about the protective cover incorporated may be taken. However, even when the protective cover is built into the photodetector, even if it arranges a protective cover different from this, it is good with a natural thing. In this case, what is necessary is just to make the configuration of claim 1 or claim 2 provide about one [at least] protective cover.

[0025] Moreover, the optical property measuring device by non-contact [concerning this invention / which made the light or near-infrared light the light source as a candidate for application of an optical property measuring device / un-destroying or non-contact] etc. is various. Moreover, it is applicable not only to the equipment which cannot but set up the power of exposure light weakly but the equipment which can set up the above-mentioned power strongly. It is because the signal from a photodetector becomes a minute amount, so it has the same trouble when the optical path length of the light in which a device under test penetrates the interior, such as being greatly thick, becomes long, as mentioned above also with such equipment.

[0026] Moreover, as the above-mentioned device under test, not only garden stuff, such as food, such as meat illustrated with the conventional technique, and a peach, citruses, grapes, a melon, a tomato, a watermelon, a Japanese pumpkin, but rice, a powder ingredient, etc. are arbitration.

[0027]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing.

[0028] [the gestalt of the first operation] -- the optical property measuring device concerning the gestalt of this operation -- the optical property (the freshness of meat is detected by whether the weak absorption band of the metmyoglobin by oxidization is detected in near 650nm.) of meat That is, it is related with the food evaluation equipment which can measure that freshness from this absorption band not being detected to fresh meat.

[0029] Namely, the tray 1 on which it consists of black ABS plastics, and the pork PM for [measured] is laid as this optical property measuring device is shown in drawing 1 - drawing 3 , The conveyance means 2 which consists of the roller conveyor which conveys this tray 1 in the direction of an arrow head, One box-like test section 3 prepared all over the conveyance way of a tray, and the semiconductor laser 4 which outputs the laser beam near 650nm, The optical fiber 5 which lead the laser beam from the semiconductor laser 4 which is the light source to the above-mentioned test section 3, and a laser beam is made to irradiate to the pork PM for [measured], The photodetector 6

with which the laser beam by which is prepared in the above-mentioned test section 3, and outgoing radiation is carried out from the pork PM for [measured] consists of the photodiode by which incidence is carried out, The tray sensor 8 which detects the detected member 7 of the patagium which has been arranged near the above-mentioned test section 3, and was prepared in the tray 1, and detects the arrival timing of a tray 1, The principal part consists of a device-under-test detector 9 which is similarly arranged near the test section 3 and judges the existence of the pork PM on a tray 1, and a guide 11 which the engagement roller 10 attached to the side face of the above-mentioned tray 1 is engaged, and it shows to the conveyance direction of a tray 1.

[0030] First, while the above-mentioned tray 1 is constituted from the shape of a rectangle by the plate made of ABS plastics as shown in drawing 1 and drawing 3 , and the receiving part 12 of a circle configuration in which the pork PM for [measured] is laid is formed in the center of abbreviation The tray side [two] optical-channel sections 13 and 14 which the open end of projection another side exposes [one open end] to the method of outside from the base side of a tray 1 from receiving part 12 top face at an upper part side are established by this receiving part 12 along that thickness direction. In addition, it is sharp and this tip side is pierced in the pork PM for [measured] by the tip side of an open end where each tray side optical-channel sections 13 and 14 project.

[0031] The measurement side optical-channel sections 31 and 32 which change from two barrels by which location adjustment was carried out with the test-section side open end of the tray side optical-channel sections 13 and 14 to the above-mentioned test section 3 on the other hand are formed. And while the optical fiber 5 which transmits the laser beam from semiconductor laser 4 in the measurement side optical-channel section 31 of one of these is arranged, in the measurement side optical-channel section 32 of another side, the photodetector 6 with which incidence of the laser beam by which outgoing radiation is carried out from Pork PM is carried out is arranged.

[0032] Moreover, while the glass protective cover 33 is inserted in the tray side open end of the measurement side optical-channel section 31 and the protective cover 34 which consists of the sintering plate of AlxZn1-xO (x= 0.01) is inserted also in the tray side open end of the measurement side optical-channel section 32, this protective cover 34 is grounded as shown in drawing 3 R> 3 and drawing 4 (touch-down).

[0033] Moreover, when the detecting signal from the above-mentioned tray sensor 8 and the device-under-test detector 9 is inputted into the power source 100 of the above-mentioned semiconductor laser 4, and the detecting signal from the device-under-test detector 9 is inputted and the detecting signal from the tray sensor 8 is inputted, a power source 100 operates and a laser beam is irradiated from semiconductor laser 4. Moreover, when the detecting signal from the device-under-test detector 9 is not inputted (namely, when Pork PM does not exist in a tray 1) or the detecting signal from the tray sensor 8 is not inputted, it is set up so that the above-mentioned power source 100 may serve as OFF.

[0034] And if the tray 1 which laid Pork PM passes a test section 3 in this optical property measuring device, the above-mentioned power source 100 will carry out ON actuation, and the laser beam near 650nm will irradiate in a test section 3. While this laser beam is irradiated in Pork PM through the measurement side optical-channel section 31 and the tray side optical-channel section 13 Incidence of the outgoing radiation light from Pork PM is carried out to a photodetector 6 through the tray side optical-channel section 14 and the measurement side optical-channel section 32, a 650nm absorption spectrum is measured, and the freshness of Pork PM is measured.

[0035] As shown in drawing 4 , even when the tray 1 which laid Pork PM is electrified by frictional electrification with the conveyance means 2 etc. at this time, the protective cover 34 prepared in the optical incidence side of a photodetector 6 is not charged by electrostatic induction.

[0036] Therefore, since the minute amount current (fake current) which considered electrification of the above-mentioned tray 1 as the cause is not included in the output current value outputted from a photodetector 6, it has the advantage which can measure this in a high precision about the optical

property of the pork PM for [measured].
[0037] In addition, in the gestalt of this operation, the above-mentioned photodetector 6 is held in cross-section abbreviation KO character-like case 6', and case 6' of a parenthesis is fixed by the internal surface of the measurement side optical-channel section 32 through adhesives 6", and it is arranged. In this case, it is desirable, especially when the internal surface of above-mentioned case 6', and the adhesives 6" and the measurement side optical-channel section 32 etc. is constituted from a conductive ingredient and the whole is grounded through the protective cover 34 (touch-down). When it is made such a configuration, it is because the photodetector 6 whole can be shielded by conductivity.
[0038] Moreover, although constituted from the baking plate of AlxZn1-xO by the above-mentioned protective cover 34 in the gestalt of this operation, while this protective cover 34 is constituted from a glass plate 36 as shown in drawing 5 , and making the tray side front face of this glass plate 36 produce the conductive light transmission film 37 which consists of an ITO thin film, the same effectiveness is acquired even if it changes into the structure where this conductive light transmission film 37 was grounded. Moreover, as shown in drawing 6 , when the glass protective cover 38 is already built into the above-mentioned photodetector 6, while making the conductive light transmission film 39 which changes from an ITO thin film to the tray side front face of this protective cover 38 produce, you may change into the structure where this conductive light transmission film 39 was grounded.
[0039] Moreover, although it has the structure which measures the laser beam by which irradiates a laser beam from the bottom to the pork PM for [measured] in the gestalt of this operation, and outgoing radiation is carried out from Pork PM with the photodetector 6 arranged to the down side, it may make the structure which measures the laser beam by which replaces with this structure, and irradiates a laser beam from a side-face side to Pork PM, and outgoing radiation is carried out from Pork PM with the photodetector which has arranged to the side-face side.
[0040] [the gestalt of the second operation] -- the optical property measuring device concerning the gestalt of this operation irradiates a laser beam to garden stuff, such as a melon and a watermelon, and is related with the non-destroying sugar content measuring device which measures the sugar content of garden stuff in un-destroying by light absorption measurement in the sugar of the laser beam by which outgoing radiation was carried out from garden stuff.
[0041] Namely, the tray 201 on which this optical property measuring device lays garden stuff M, such as a melon for [measured], as shown in drawing 7 - drawing 8 , The conveyance means 202 which consists of the roller conveyor which conveys this tray 201 in the direction of an arrow head, Three box-like test sections 203, 204, and 205 suitably arranged through spacing in this conveyance way, The optical fibers 271, 272, and 273 which lead the laser beam from three semiconductor laser 261, 262, and 263 which is the light source to the above-mentioned test sections 203, 204, and 205, and a laser beam is made to irradiate to the above-mentioned garden stuff M, Each test sections 203 and 204 and the photodetector 206 with which incidence of the laser beam by which is prepared in 205, respectively and outgoing radiation is carried out from garden stuff M is carried out, The tray sensor which detects detected members (not shown), such as a light reflex tape which has been arranged near each test sections 203, 204, and 205, and was prepared in the above-mentioned tray 201, and detects the arrival timing of the tray 201 in each test sections 203, 204, and 205 (not shown), The analog-to-digital converter 281 which changes the analog data from the above-mentioned photodetector 206 into digital data, The computer 282 with a display into which the arrival signal from data and the tray sensor from the above-mentioned photodetector 206 etc. is inputted through this analog-to-digital converter 281 (CPU), That principal part consists of an analog-to-digital converter 283 connected to this computer (CPU) 282, and power sources 291, 292, and 293 for exciting respectively the above-mentioned semiconductor laser 261, 262, and 263.
[0042] Moreover, the above-mentioned tray 201 consists of black ABS (acrylonitrile styrene

butadiene rubber) resin, as shown in drawing 8 . Project to an upper part side from cylinder-like the tray bottom section 211 and this tray bottom section 211, and that principal part consists of the approximate circle column-like tray top sections 212 which have the datum level 200 of the pair which cut that part and was formed by lacking. And while the earthenware mortar-like receiving part 213 is formed in the top face of the above-mentioned tray top section 212 and the tray side [two] optical-channel sections 214 and 215 are formed in this receiving part 213 The detected member which consists of a light reflex tape etc. is prepared in each upper part section of the datum level 200 of the pair, and **** 216 into which **** 290 prepared in the top face of the above-mentioned test sections 203, 204, and 205 is made to fit loosely possible [sliding] is formed in the base side abbreviation center section of the tray bottom section 211. In addition, the color of the tray 201 whole is black, and opaque.

[0043] On the other hand, above-mentioned **** 290 is formed in the top-face side central part at each test sections 203, 204, and 205. And while the measurement side optical-channel sections 231 and 232 which consist of two barrels by which location adjustment was carried out with the test-section side open end of the above-mentioned tray side optical-channel sections 214 and 215 are formed The optical fiber 271 which transmits the laser beam from the above-mentioned semiconductor laser 261 to the open end of the measurement side optical-channel section 231 of one of these is arranged. The photodetector 206 is arranged in the measurement side optical-channel section 232 of another side (although it is explanation about a test section 203, also in other test sections 204 and 205, it has same structure). In addition, the operation of **** 290 prepared in the top-face side of the above-mentioned test section 203 prevents the enter lump into the measurement side optical-channel section 232 of the laser beam from an optical fiber 271 which passes the measurement side optical-channel section 231, in order that this **** 290 may intercept the clearance between a tray 201 and a test section 203, as shown in drawing 8 . For this reason, incidence only of the outgoing radiation light from garden stuff M will be carried out to the photodetector 206 arranged in the measurement side optical-channel section 232, and the measurement error of the sugar content resulting from the leakage light of the above-mentioned laser beam can be avoided.

[0044] Moreover, while the glass protective cover 233 is inserted in the tray side open end of the above-mentioned measurement side optical-channel section 231 While the conductive light transmission film 235 which the glass protective cover 234 is inserted also in the tray side open end of the measurement side optical-channel section 232, and changes from an ITO thin film to the tray side front face of this protective cover 234 is produced This conductive light transmission film 235 is grounded as shown in drawing 8 (although it is explanation about a test section 203, also in other test sections 204 and 205, it has same structure). (touch-down)

[0045] Whenever the tray 201 which laid garden stuff M in this optical property measuring device passes each test sections 203, 204, and 205, each power sources 291, 292, and 293 carry out ON actuation. While a 930nm laser beam irradiates between 20 mses in a test section 203 and this laser beam is irradiated from an optical fiber 271 to garden stuff M through the measurement side optical-channel section 231 and the tray side optical-channel section 214 Incidence of the outgoing radiation light from garden stuff M is carried out to a photodetector 206 through the tray side optical-channel section 215 and the measurement side optical-channel section 232. Hereafter, in a test section 204, a 880nm laser beam is similarly irradiated to a 910nm laser beam between 20 mses in a test section 205 between 20 mses, and incidence of the outgoing radiation light from garden stuff M is carried out to each photodetector (not shown), and the sugar content of garden stuff M is measured. In addition, as shown in drawing 7 , measurement of this etc. is performed in a dark room.

[0046] And as this optical property measuring device is shown in drawing 8 R> 8, even when the tray 201 which laid garden stuff M is electrified by frictional electrification with the conveyance means 202 etc., each protective cover (the protective cover 234 of a test section 203 is shown in drawing 8) prepared in the optical incidence side of each photodetector (the photodetector 206 of a test section

203 is shown in drawing 8) is not charged by electrostatic induction.
[0047] Therefore, since the minute amount current (fake current) which considered electrification of a tray 201 as the cause is not included in the output current value outputted from each photodetector, it has the advantage which can measure this in a high precision about the optical property of the garden stuff M for [measured] like the optical property measuring device concerning the gestalt of the first operation.
[0048] [the gestalt of the third operation] -- the optical property measuring device concerning the gestalt of this operation is related with a non-destroying sugar content measuring device as well as the equipment concerning the gestalt of the second operation.
[0049] Namely, the box 302 which has the installation base 301 made of ABS plastics in which a whole surface side can open and close by the door 300, and garden stuff M is laid as this optical property measuring device is shown in drawing 9 , It is each laser beam (930nm) to the garden stuff M which led to the test section (not shown) in which each laser beam from three semiconductor laser 361, 362, and 363 was prepared at the lower part side of the above-mentioned installation base 301, and was laid in the installation base 301. The optical fibers 371, 372, and 373 which carry out the sequential exposure of 910nm and the 880nm, The single photodetector with which incidence of the laser beam (930nm, 910nm, and 880nm) by which is arranged at the above-mentioned test section and outgoing radiation is carried out from garden stuff M is carried out (not shown), The analog-to-digital converter which changes the analog data from this photodetector into digital data, The computer 382 into which the data from the above-mentioned photodetector etc. are inputted (CPU), The analog-to-digital converter connected to this computer (CPU) 382, The principal part consists of power sources 391, 392, and 393 for exciting respectively the above-mentioned semiconductor laser 361, 362, and 363. And if it changes from the sintering plate of AlxZn1-xO (x= 0.01) to the optical incidence side of the above-mentioned photodetector, the protective cover (not shown) by which the ** ground (touch-down) was carried out is arranged.
[0050] In addition, in this optical property measuring device, the sugar content of garden stuff M, such as a melon, is measured by the same principle as the equipment concerning the gestalt of the second operation.
[0051] And even when the installation base 301 in which the above-mentioned garden stuff M is laid in this optical property measuring device is charged by a certain cause, the protective cover prepared in the optical incidence side of a photodetector is not charged by electrostatic induction.
[0052] Therefore, it has the advantage which can measure this in a high precision about the optical property of the garden stuff M for [measured] like the optical property measuring device concerning the gestalt of the second operation.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The light source which irradiates light to the device under test laid in the receiving part material which consisted of insulating ingredients, In the optical property measuring device which measures the optical property of a device under test from the reflected light by which the reflected light or the transmitted light from the above-mentioned device under test was equipped with the photodetector of the photoelectromotive-force mold by which incidence is carried out, and incidence was carried out to this photodetector, or the transmitted light The optical property measuring device characterized by preparing the protective cover which consisted of conductive ingredients of light transmission nature in the optical incidence side of the above-mentioned photodetector, and grounding this protective cover.
[Claim 2] The light source which irradiates light to the device under test laid in the receiving part material which consisted of insulating ingredients, In the optical property measuring device which measures the optical property of a device under test from the reflected light by which the reflected light or the transmitted light from the above-mentioned device under test was equipped with the photodetector of the photoelectromotive-force mold by which incidence is carried out, and incidence was carried out to this photodetector, or the transmitted light The optical property measuring device characterized by grounding this conductive light transmission film while the protective cover which consisted of insulating ingredients of light transmission nature is prepared in the optical incidence side of the above-mentioned photodetector and the conductive light transmission film is produced by one side or both sides of this protective cover.
[Claim 3] The optical property measuring device according to claim 1 or 2 which the above-mentioned receiving part material is the tray conveyed by the conveyance means, and is characterized by measuring the optical property of the device under test laid while making the above-mentioned tray convey in the test section prepared all over the conveyance way.
[Claim 4] The above-mentioned conductive light transmission film is ITO (indium oxide by which tin oxide was added) or SnO2, ZnO, and InO2. Or optical property measuring device according to claim 2 or 3 characterized by being mixed oxides, such as this.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The perspective view showing the principal part of the optical property measuring device concerning the gestalt of the first operation.
[Drawing 2] The explanatory view showing the configuration of the whole optical property measuring device concerning the gestalt of the first operation.
[Drawing 3] The tray in drawing 1 , and the sectional view of a test section.
[Drawing 4] The explanatory view explaining an operation of a protective cover 34.
[Drawing 5] The partial explanatory view of the optical property measuring device concerning a modification.
[Drawing 6] The partial explanatory view of the optical property measuring device concerning a modification.
[Drawing 7] The explanatory view showing the configuration of the whole optical property measuring device concerning the gestalt of the second operation.
[Drawing 8] The tray concerning the gestalt of the second operation, and the sectional view of a test section.
[Drawing 9] The explanatory view showing the configuration of the whole optical property measuring device concerning the gestalt of the third operation.
[Drawing 10] The perspective view showing the principal part of a non-destroying sugar content measuring device.
[Drawing 11] The tray of a non-destroying sugar content measuring device, and the sectional view of a test section.
[Drawing 12] The explanatory view for explaining the trouble of a non-destroying sugar content measuring device.
[Description of Notations]
1 Tray (Receiving Part Material)
2 Conveyance Means
3 Test Section
4 Semiconductor Laser
5 Optical Fiber
6 Photodetector
34 Protective Cover
PM Pork (device under test)

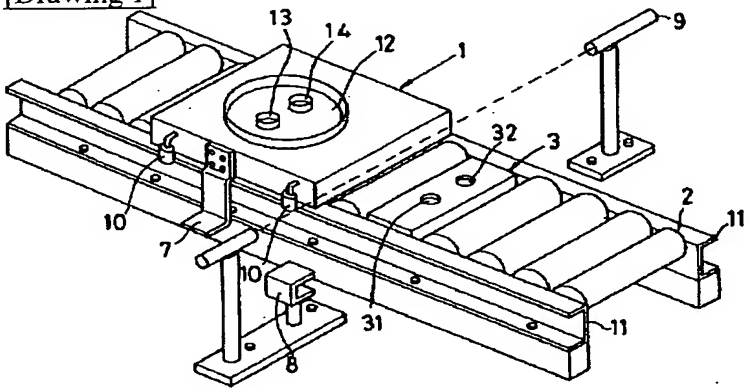
[Translation done.]

* NOTICES *

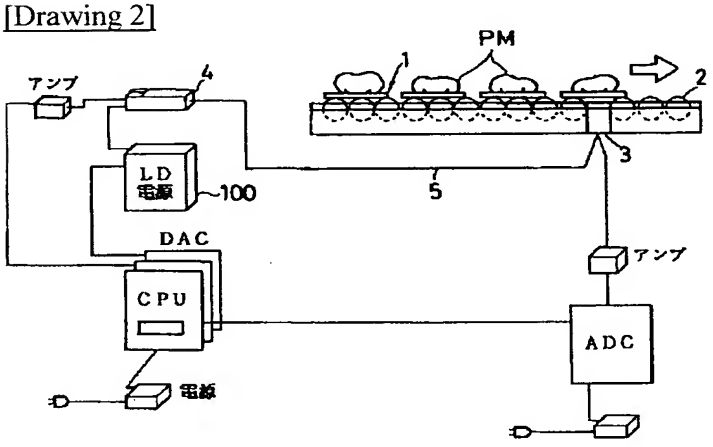
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

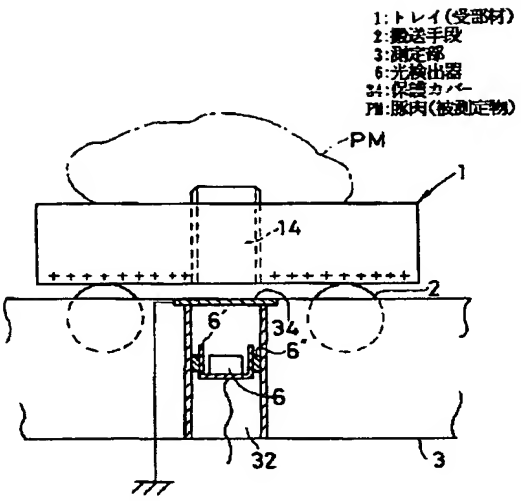
[Drawing 1]



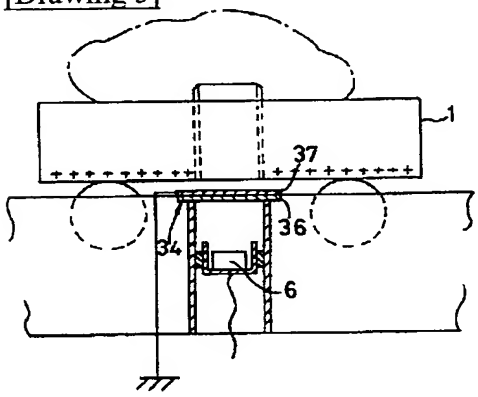
[Drawing 2]



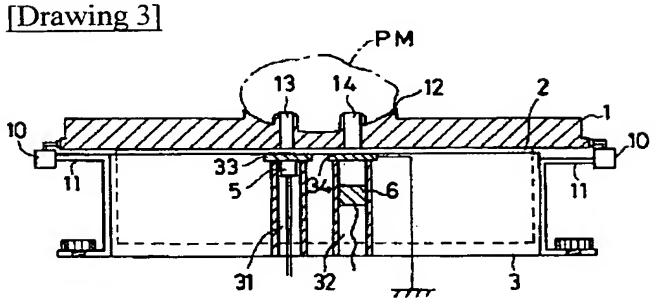
[Drawing 4]



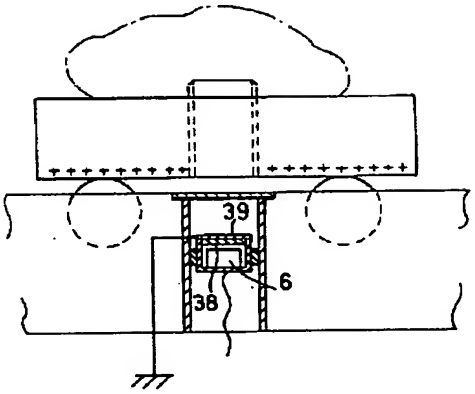
[Drawing 5]



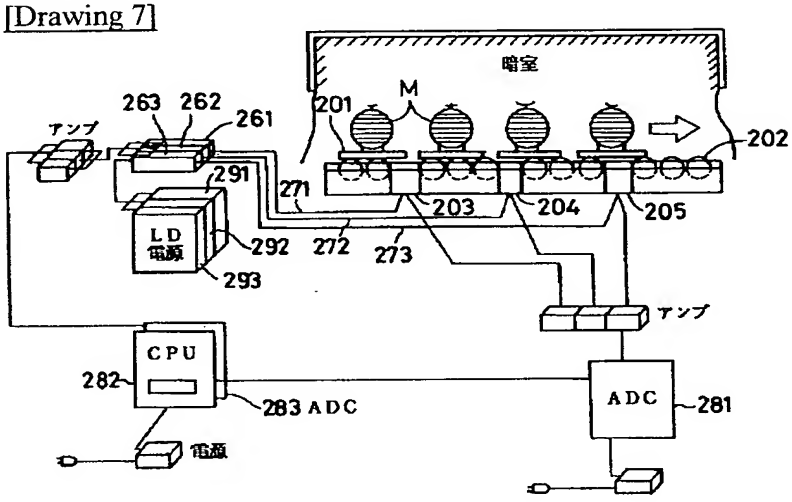
[Drawing 3]



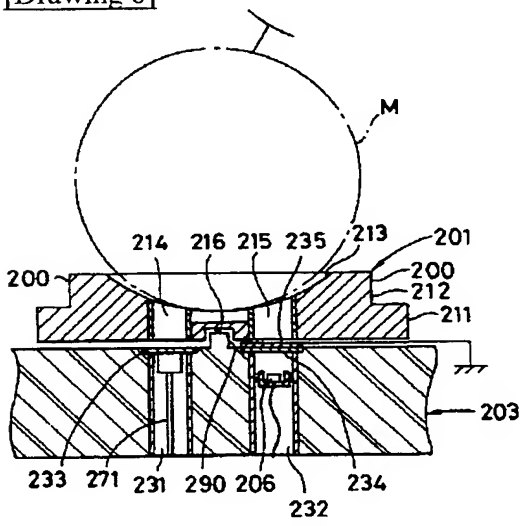
[Drawing 6]



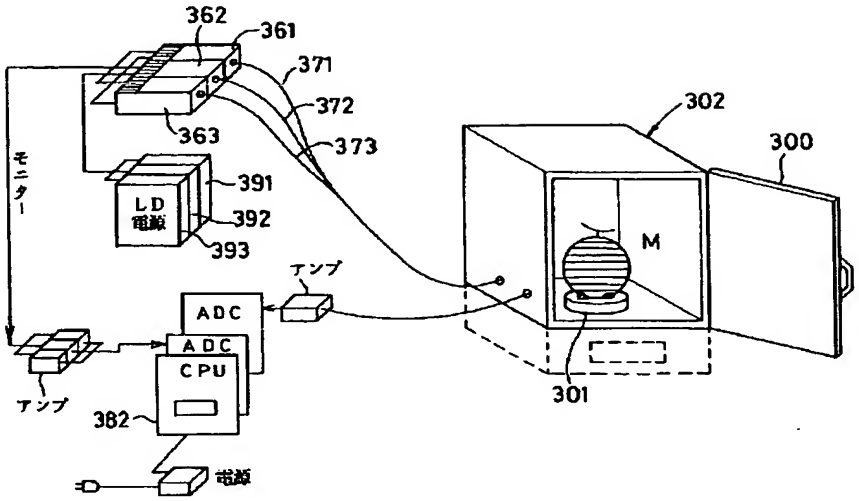
[Drawing 7]



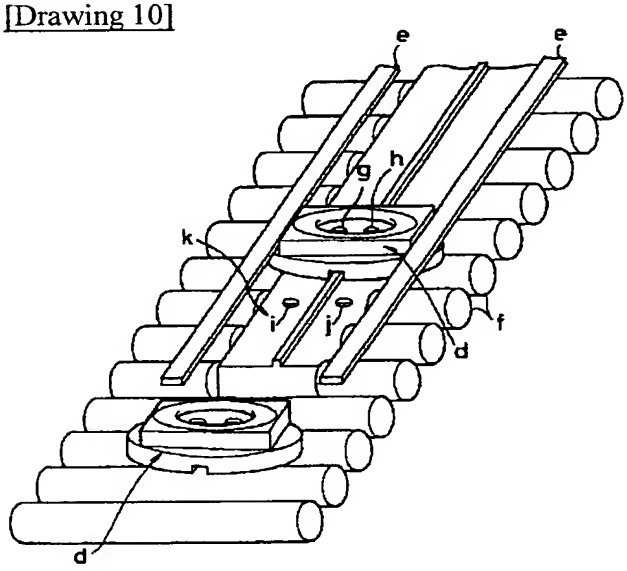
[Drawing 8]



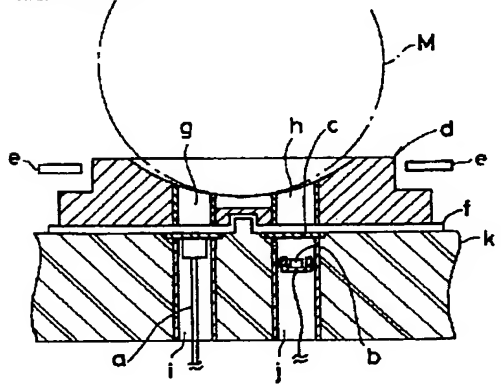
[Drawing 9]



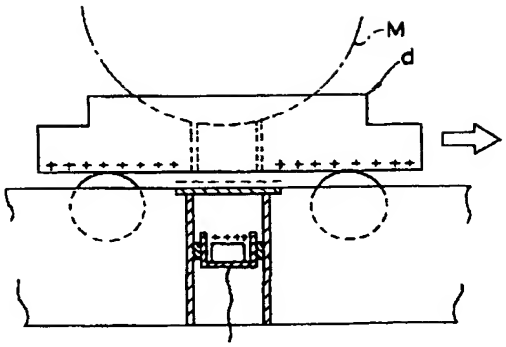
[Drawing 10]



[Drawing 11]



[Drawing 12]



[Translation done.]